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Addition of two species to the Maltese flora: *Lythrum tribracteatum* Salzm. ex Spreng. (Lythraceae) and *Poa maroccana* Nannf. (Poaceae)

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Abstract. During a fieldwork in Malta in 2023, we discovered two species of plant previously unknown to the Maltese flora, *Lythrum tribracteatum* Salzm. ex Spreng. and *Poa maroccana* Nannf. Specific information on their morphology and ecology is provided.

Keywords. Distribution extension, new records, rock pools, taxonomy, vascular plants

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Introduction

Studies on flora are crucial in investigating biodiversity, particularly in the Mediterranean region. This area is globally recognized as a biodiversity hot spot and a significant center for plant diversity (Medail and Quezel 1997). Detailed and comprehensive research has recently resulted in the discovery and description of new species over time in this territory (Selvi 2020; Mei et al. 2021; Khamar et al. 2022; Brullo et al. 2023). The Maltese Archipelago located in the central Mediterranean Sea, is renowned for its unique flora (Lanfranco 1995). Specifically, the islands of Malta, Gozo, and Comino host a remarkable variety of plants, with numerous endemic species such as *Cheirolophus crassifolius* (Bertol.) Susanna, *Cremnophyton lanfrancoi* Brullo & Pavone, and *Helichrysum melitense* (Pignatti) Brullo, Lanfranco, Pavone & Ronsisvalle. The Maltese flora is a combination of Mediterranean, North African, and Middle Eastern influences, reflecting the strategic geographic position and climate of the archipelago.

For centuries, many authors have thoroughly investigated the flora of the Maltese islands. The earliest records of Maltese flora date back to pre-Linnaean authors, including Abela (1647) and Boccone (1674, 1697). In the 19th century, Zerapha (1827) documented the flora of Malta and listed 644 species, both native and cultivated. Numerous floras focusing on the Maltese Islands have been published in the 19th and 20th centuries. Among these, the most significant are "Flora Melitensis" by Grech Delicata (1853), and "Flora Melitensis Nova" by Sommier and Caruana Gatto (1915), which presents a comprehensive catalogue of all the species discovered in Malta up to that time. Later, other notable works and floristic contributions on Maltese flora were published by Borg (1927), Lanfranco (1969), Haslam et al. (1977), and more recently by Weber and Kendzior (2006), Lanfranco and Bonnett (2015), and Casha (2020).

Regarding the genera *Lythrum* L. and *Poa* L. from the Maltese Islands, Sommier and Caruana Gatto (1915) reported two species of *Lythrum* (*L. junceum* Banks & Sol. and *L. hyssopifolia* L.) and suspected *L. tribracteatum* Salzm. ex Spreng. was present; however, the latter species was not confirmed and, therefore, not included in their flora. Sommier and Caruana Gatto (1915) included three species of *Poa* (*P. annua* L., *P. bulbosa* L., and *P. trivialis* L.) in the flora of the Maltese Islands. Haslam et al. (1977) later confirmed all the previous records and reported the occurrence of *P. infirma* Kunth for the first time in Mellieħa, Malta. According

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to Casha (2020), many of these species have been confirmed, while Mifsud (2022) has reported two additional species of *Poa*: *P. pratensis* L. and *P. angustifolia* L. Here, we report the discovery of *L. tribracteatum* and *P. maroccana* Nannf. from Malta; both species are new additions to the Maltese flora.

To confirm these findings and aid in identifying these plants in the field, a taxonomic description, photographic images of their distinguishing features, and a comparison with their related species, *L. hyssopifolia* and *P. annua*, are included.

Methods

In field surveys in 2023 in Malta, we found two species new to the Maltese flora. Observations of morphological features of the collected specimens were made under a Zeiss Stemi 500 stereomicroscope. Photographs were taken with an Axio Cam high-resolution digital camera and Zen 2.5 Lite software. We thoroughly researched the literature to identify any existing Maltese records of these species; the literature consulted included Sommier and Caruana Gatto (1915), Haslam et al. (1997), Brullo et al. (2020), and Casha (2020). Our specimens were preserved in the herbarium of the University of Catania (CAT; herbarium acronym according to Thiers 2023) and identified to species using Pignatti et al. (2017, 2019) and Brullo et al. (2021).

Results

***Lythrum tribracteatum* Salzm. ex Spreng.**, Syst. Veg., ed. 16 [Sprengel] 4(Cur. Post.): 190 (1827)
Figure 1

New records. MALTA • Pembroke, in a temporary freshwater rock pool; 35°55′44″N, 014°29′08″E; 23 m a.s.l.; 10.V.2023; S. Lanfranco leg.; CAT 3064.

Identification. Annual plant, 6–30 cm high, stem erect or prostrate, branched, opposite, quadrangular, usually papillose reddish. Leaves 3–9 × (1)2–3 mm, alternate, linear to oblong-elliptical. Flowers homostylous, solitary, axillary, pedicels up to 0.5 mm with two bracts (1–2 mm long). Floral tube 4.0–6.0 × 1.0–1.5 mm, tubuliform with 12 purplish nervatures. Sepals 6(5) about 0.25 mm, membranaceous, sometimes tinged with red, with 8–10 subequal triangular teeth. Petals 6(5), 2–3 mm long, oblong-elliptical, purplish. Stamens 2–6, included in the floral tube. Style, 1.5–2.0 mm long, included. Capsule, cylindrical, usually equal in length to the floral tube when mature. Seeds about 0.5–1.0 mm long, obovoid to rhomboid (Fig. 2; Table 1).

Distribution. According to Valdés (2012), *L. tribracteatum* occurs in the Mediterranean basin and east to central Asia. Our new record from Pembroke (Malta) adds another location for this species in the Mediterranean basin (Fig. 3A, B).

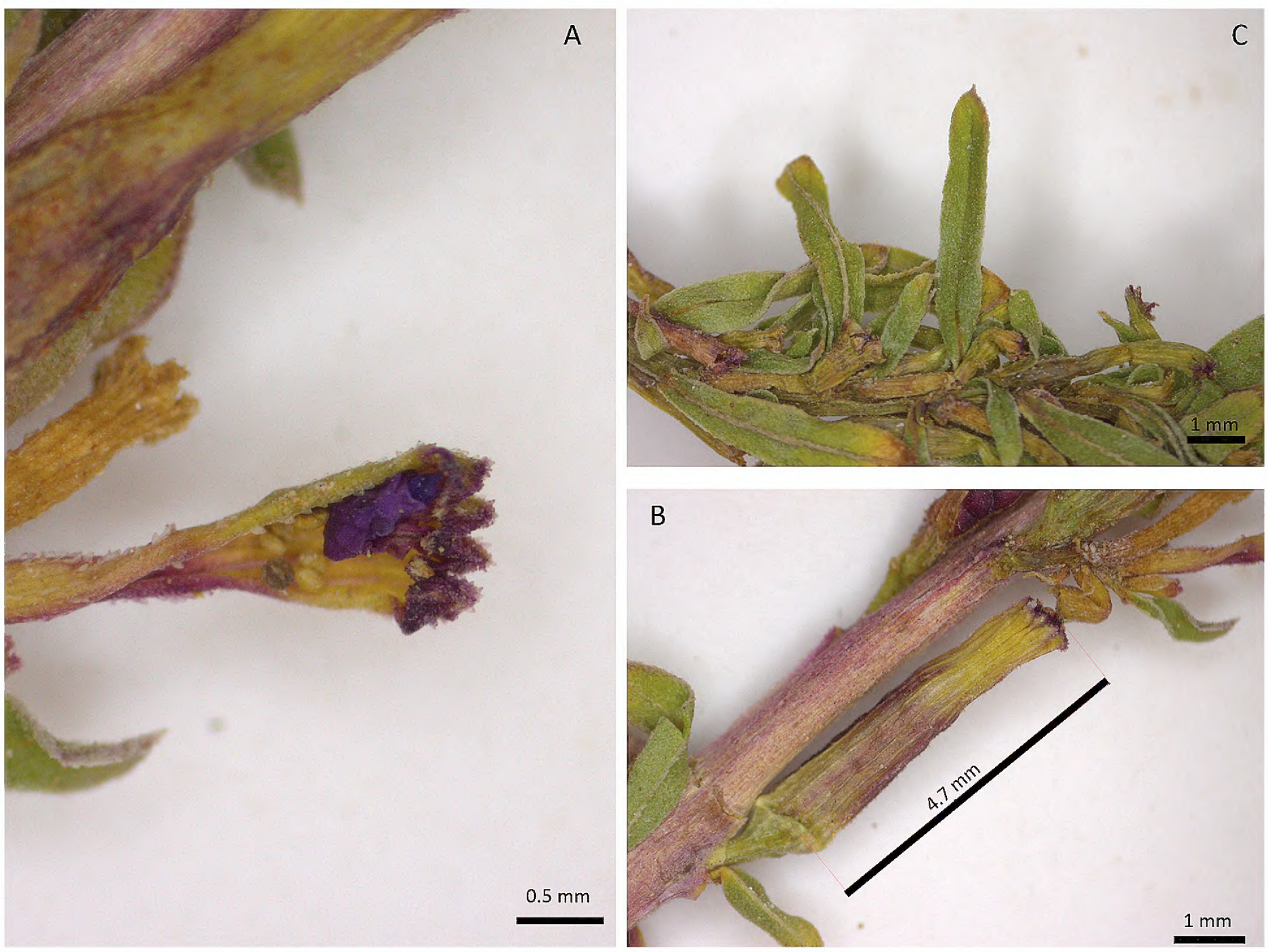

Figure 1. *Lythrum tribracteatum* collected in Pembroke, Malta. **A.** Triangular teeth of the sepal. **B.** Floral tube. **C.** Leaves.

HERBARIUM UNIVERSITATIS CATANENSIS
00 3064
Flora MALTA
Name Lythrum tribracteatum Salzm. ex Spreng
Locality Pembroke, in a temporary freshwater rock pool [35°55'44.73''N, 14°29'08.58''E]; 23 m elev.
Coll. S. Lanfranco
Date 10/05/2023 Det. S. Lanfranco

Figure 2. Herbarium specimen of *Lythrum tribracteatum* from Pembroke, Malta.

Table 1. Comparison of the main morphological characters distinguishing *Lythrum tribracteatum* and *L. hyssopifolia*.

Characters	*L. tribracteatum*	*L. hyssopifolia*
Stems	6–30 cm high	17–40 cm high
Leaves shape	Linear to oblong-elliptical	Lanceolate
Leaves size	3–9 × (1)2–3 mm	10–14 × 2–3 mm
Flowers pedicel	0.5 mm	1.0 mm
Floral tube	4.0–6.0 × 1.0–1.5 mm	3.5–4.5 × 0.75–1.0 mm
Calyx teeth	Teeth subequal	Alternately long and short teeth
Seeds	Ca. 0.5 mm	Ca. 0.75 mm

Figure 3. Distribution map of *Lythrum tribracteatum* and *Poa maroccana* in Malta. **A.** Geographical distribution in Malta (ESRI base-map imagery). **B.** Current distribution of *L. tribracteatum* (green polygons) according to Valdés (2012), red star new record from Malta. **C.** Current distribution of *P. maroccana* (green polygons) according to Brullo et al. (2021), red star new record from Malta.

Figure 4. *Poa maroccana* collected in Sliema, Malta. Detail of spikelets.

***Poa maroccana* Nannf.**, Svensk Bot. Tidskr. 32: 296 (1938)

Figure 4

New records. MALTA • Sliema, along the roadside; 35°54′53″N, 014°29′51″E; 15 m a.s.l.; 13.V.2023; G. Tavilla leg.; CAT 3065.

Identification. Annual, glabrous, without rhizomes, tufted, many-stemmed. Culms 10–40 cm high, erect or weakly geniculate at base, with 4–6 nodes. Leaves 4–6, with sheath 5–40 mm long, fused up to ⅓ of length, blade flat, 15–40 × 1.5–4.5 mm, ligule rounded, sometimes triangular-oblong, ca. 1 mm long. Panicle 4–9 cm long, triangular-ovate to oblong-rhombic, erect, lax, with 1 or 2 branches per node, erect to ascending. Spikelets 5.5–6.5 mm long, narrowly ovate to oblong-linear, laterally compressed, green, with 4–5(6) spaced florets and well-exposed rachilla. Glumes unequal, shorter than adjacent lemmas, glabrous, ovate-oblong to lanceolate, distinctively nerved, with surfaces smooth and hyaline at the margins; lower glume 2–3 mm long, 1-nerved, subacute; upper glumes 2.5–3.0(4.0) mm long, 3-nerved, obtuse to subacute. Lemmas 2.8–3.7 mm long, ovate to ovate-oblong, with 5 clearly distinct nerves, all densely villous and not reaching the margin. Palea hyaline, 2.3–3.0 mm long, with keels villous throughout their length, shortly ciliolate along the upper ⅔, bifid at the apex, with flanges appressed. Flowers bisexual, lodicules 0.3–0.4 mm long, pyriform, glabrous, anthers 0.7–1.3 mm long, yellow, inserted on very short filaments. Styles 0.7–0.8 mm long, plumose. Ovary 0.3 mm long. Caryopsis adherent to palea, 1.0–1.4 mm long, fusiform, subtrigonous in cross section (Fig. 5; Table 2).

Distribution. According to Brullo et al. (2021), *P. maroccana* has a scattered distribution in the Mediterranean basin. Our new record from Sliema (Malta) expands this species' geographical range in the region (Fig. 3A, C).

Discussion

Lythrum tribracteatum has a Mediterranean to central Asian distribution (POWO 2023). It occurs in microsites with soil having a high carbon content and a high geophyte cover (Gazaix et al. 2021). The Maltese Islands are known for their extensive limestone formations, which feature numerous karstic rockpools which are often inundated during the wet season. This habitat hosts a specialized plant community with a peculiar floristic set. These species have a significant phytosociological role, forming distinct plant communities. From an ecological and phytosociological viewpoint, *L. tribracteatum* is a characteristic species of the *Lythrion*

HERBARIUM UNIVERSITATIS CATANENSIS
00 3065
Flora MALTA
Name Poa maroccana Nannf.
Locality Sliema, along the roadside [35°54′53″N, 14°29′51″E]; 15 m elev.
Coll. G. Tavilla
Date 13/05/2023 Det. G. Tavilla

Figure 5. Herbarium specimen of *Poa maroccana* from Sliema, Malta.

Table 2. Comparison of the main morphological characters distinguishing *Poa maroccana* and *P. annua*.

Characters	*P. maroccana*	*P. annua*
Stem size	10–40 cm	5–30 cm
Stem nodes	4–6	(1)2–3
Leaf sheath length	0.5–4 cm	1–6 cm
Ligule	0.9–1.0 mm	0.5–3.0(5.0) mm
Ligule shape	Rounded, rarely triangular-oblong	Ovate-oblong, obtuse to truncate, irregularly denticulate margin
Leaf blade size	15.0–40.0 × 1.5–4.5 mm	10.0–100.0 × 1.0–5.0 mm
Inflorescence shape	Panicle triangular-ovate to oblong-rhomboidal	Panicle erect, open, pyramidal to ovoid
Spikelet length	5.5–6.5	3.0–5.0(7.0)
Spikelet shape	Narrow ovate to oblong-linear	Ovate to oblong
Spikelet rachilla	Well exposed	Usually not exposed
Lemma keel indumentum	Densely villous	Glabrous and hairy in the ribs in lower 1/2
Lodicule shape	Pyriform	Broadly lanceolate to ovate, lobed
Caryopsis length	1.0–1.4 mm	1.5–2.3 mm

tribracteati Rivas Goday & Rivas-Martínez ex Rivas Goday 1970 alliance, which belongs to the plant communities of the *Isoëto–Nanojuncetea* class in the western Mediterranean regions (Brullo et al. 2022). This habitat type groups ephemeral, hygrophilous plant communities occurring in wetlands with long-duration flooding and a summer–autumnal optimum (Brullo et al. 2022). This vegetation type is linked to silty-clay soils submerged by eutrophic waters, which are sometimes weakly brackish (Brullo et al. 2020). These plant communities, due to their ecological role, have been recognized by the Habitats Directive (43/92 EEC) as a priority conservation habitat under code 3170* (Mediterranean temporary ponds; Tavilla et al. 2022). This peculiar habitat hosts Mediterranean communities with very small plants, often very rare or not easily observed due to their short life cycle. This vegetation type is ascribable to several phytocoenoses, as evidenced by the various new associations described in Mediterranean territories (e.g. Perrino and Signorile 2009; Tomaselli et al. 2020; Brullo et al. 2022, 2023; Perrino et al. 2022). *Lythrum tribracteatum* is most similar to *L. hyssopifolia*, from it mainly differs in having the appendages of the calyx narrowly triangular and equal to the sepals (versus triangular-lanceolate and 2–4 times longer than the sepals in *L. hyssopifolia*). Sommier and Caruana Gatto (1915) had previously remarked that juvenile *Lythrum* plants were found in wet areas of Malta (San Paul) and Gozo (Ta Cenc). Based solely on their analysis of leaf morphology, these authors attributed these plants to *L. tribracteatum*. However, they believed that the determination was too uncertain to confirm this species in the Maltese flora. Therefore, it is highly probable that *L. tribracteatum* has occurred on the island for a long time. Our rediscovery of this species accentuates the importance of conducting further studies to ascertain its distribution in the rocky pools across Malta.

As for the other species reported here, *Poa maroccana*, we found it in synanthropic habitat with a high anthropic pressure (Sliema urban centre). This species had remained relatively overlooked and misidentified until its recent reevaluation by Brullo et al. (2021), who discovered it in urban areas in eastern Sicily. *Poa maroccana* grows well in areas affected by human activities, such as roadsides, gardens, ditches, and temporarily flooded areas. These habitats have differing levels of moisture and nitrification in the soil. *Poa maroccana* usually shares these environments with other annual species of *Poa*, including *P. annua* and *P. infirma*, but in these situations fertile hybrids never occur (Nannfeldt 1938; Scholz 1993, 1996). According to Brullo et al. (2021) and POWO (2023), *P. maroccana* has a scattered distribution in many countries around the Mediterranean. It occurs in Morocco, Algeria, Tunisia, Libya, Portugal, Spain, Greece, Crete, Turkey, Syria, Crimea, and Sicily. Our record is the first from Malta. However, as Scholz (1993) had pointed out, *P. maroccana* is likely more prevalent than the present data suggest, primarily due to previous misidentifications. *Poa maroccana* can be distinguished from the similar *P. annua* by the stem size (up to 40 cm), number of stem nodes (4–6), and a panicle that is never pyramidal or ovoid, branches erect to ascending, and spikelets with spaced florets not hiding the rachilla.

The current findings of two new plant species in Malta emphasizes the need for more research on the native and non-native flora to enhance our understanding of it. Floristic studies and field investigations are important, as they can improve floristic knowledge in a territory (Stinca et al. 2021). Additionally, such studies

contribute to cataloging and management of alien species, which pose a threat to the biodiversity of the Mediterranean basin, especially on the islands (Cambria et al. 2023; Minissale et al. 2023).

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Author Contributions

Conceptualization: GT, SL. Data curation: GT, SL. Funding acquisition: PM. Investigation: GT, SL. Methodology: GT, SL. Visualization: GT. Writing – original draft: GT, SL. Writing – review and editing: GT, PM, SL, LC.

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